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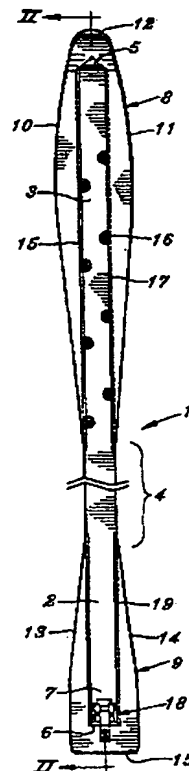
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/IB98/01201 (22) International Filing Date: 20 July 1998 (20.07.98) (30) Priority Data: 08/897,940 21 July 1997 (21.07.97) US (71)(72) Applicant and Inventor: OLSEN, Fred [NO/NO]; Biskop Grimelunds VEI 21, N-0374 Oslo (NO). (74) Agent: TOFTING, Arild; Bryns Patentkontor A/S, P.O. Box 765, Sentrum, N-0106 Oslo (NO).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  Published With international search report.

(54) Title: SKI CONVERSION APPARATUS

## (57) Abstract

Ski conversion apparatus for converting a cross-country ski to a downhill contoured ski. A tip shape modifier is attached to the tip section of the ski by expandable wedge assemblies and mating dovetails. A tail shape modifier is attached to the tail section of the ski by longitudinal dovetails and a detachable connection. The tip shape and tail shape modifiers are carried by the cross-country skier and attached to the cross-country skis when necessary to ski downhill in deep snow.



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## SKI CONVERSION APPARATUS

### TECHNICAL FIELD

This invention relates to sport and recreational equipment and more particularly to snow skis.

### BACKGROUND ART

Skiing is a popular winter sport and is generally divided into two categories - cross-country skiing (or touring) over level or relatively gentle slopes and downhill skiing over relatively steep or uneven terrain. Therefore, the ski equipment for the two types of skiing is different, cross country skis being relatively long, slender, of uniform width and light in weight, while downhill skis are shorter, wider and of heavier construction. A new type of advanced downhill ski assumes an hour glass shape, which is easier to maneuver during turns.

Cross-country skis are very effective for maneuvering in remote areas. However, if a cross-country skier climbs a hill and encounters virgin snow, the cross-country skis are not very good at floating on the snow surface. In fact, standard cross-country skis, which are narrow and of uniform width, tend to sink into fresh powder and have little control in deep snow.

The prior art has suggested various types of adapters or attachments for skis which enhance their operation for particular purposes or change the characteristics of the skis. Examples of this prior art are seen in the following U.S. Patents: 2,410,702 issued November 5, 1946 to Arsenault; 3,820,802 issued June 28, 1974 to Davis; 4,006,912 issued February 8, 1977 to Perlich et al.; and 4,180,275 issued December 25, 1979 to Montoya. None of these inventors have addressed the problem of skiing down hill over steep terrain or through fresh powder after climbing a hill on cross-country skis.

### DISCLOSURE OF INVENTION

Briefly stated, the invention comprises apparatus for converting a cross-country ski to a downhill ski, the cross-country ski being of the type having a central section with means for attachment to a skier's boot, a tip section extending forwardly from the central portion and curving upwardly, and a tail section extending rearwardly from the central section, the central

section, tip section and tail section together being of substantially the same width, said apparatus being characterized by first and second attachment means disposed on the tip section and tail section respectively, a tip shape modifier adapted to be attached to the first attachment means on the tip section and gradually increasing in width along a major part of the tip section toward the front of the ski, a tail shape modifier adapted to be attached to the second attachment means on the tail section, and gradually increasing in width along a major part of the tail section toward the rear of the ski, said tip shape modifier and said tail shape modifier being contoured so as to define, together with the ski central section, a generally hour-glass shape adapted for downhill skiing.

In the preferred embodiment the tip and tail shape modifiers are U-shaped and the skis and modifiers are provided with mating dovetail connections on their lateral sides. The tail shape modifier preferably includes a detachable connection strap which is held in a bracket mounted on the ski tail section.

#### BRIEF DESCRIPTION OF DRAWINGS

The invention will be better understood by reference to the following description, taken in connection with the accompanying drawings, in which:

Fig. 1 is a plan view of a cross-country ski fitted with conversion apparatus according to the present invention, and omitting a part of the central section,

Fig. 2 is a side elevational view in cross-section taken along lines II - II of the ski and conversion apparatus of Fig. 1,

Fig. 3 is an enlarged plan view of the tail section of the ski with tail shape modifier,

Fig. 4 is an enlarged plan view of the tip section of the ski with tip shape modifier,

Fig. 5 is a cross sectional elevational view taken along lines V - V of Fig. 3,

Fig. 6 is a cross-sectional elevational view taken along lines VI - VI of Fig. 4,

Fig. 7 is an enlarged cross-sectional elevational view taken along lines VII - VII of Fig. 3,

Fig. 8 is a partial side elevational view in cross section of a modified tail shape modifier attachment,

Fig. 9 is a partial end elevational view in cross section of the Fig. 8 modification, and

Fig. 10 is a cross sectional view of a modified tip shape modifier attachment.

### BEST MODE FOR CARRYING OUT THE INVENTION

Referring now to Figs. 1 and 2 of the drawing, a cross-country ski is shown fitted with the apparatus according to the present invention. The ski, shown generally at 1, includes a tail section 2, a tip section 3, and a central section 4. It will be understood by those skilled in the art that the complete central section 4 (only a portion of which is shown in the drawing) includes a binding adapted for attachment of the ski 1 to a skier's boot in the case of each of two skis. This detail is not shown, since this would greatly reduce the scale of the drawing in order to enable the full length of the ski to be shown. However, it will be understood that the central section 4 includes a binding (not shown) for a ski boot located near the center of ski 1. The tail section 2, central section 4, and tip section 3 are all of substantially uniform lateral width as is generally the case with a convention cross-country ski. The end of tip section 3 is curved upwardly in a vertical plane terminating at a tip 5, whereas the tail section 2 is flat, terminating at a tail 6 to provide a platform area 7.

In accordance with the present invention, ski 1 is adapted to accommodate tip shape modifier shown generally at 8 and a tail shape modifier shown generally at 9. The tip modifier 8 is generally U-shaped with side portions 10, 11 connected by front portion 12. Tip shape modifier 8 is curved upwardly in a vertical plane to correspond to the curvature of ski tip section 3. The sides 10, 11 of tip shape modifier 8 are contoured to gradually increase in width along a major part of the ski tip section 3 to a maximum about two-thirds of their length and then to decrease in width until joining with an end portion 12. Metal edges are provided along outer sides of the top modifier 8 for providing "edging" action during skiing. These edges are preferably metal and are not unlike conventional edges provided on ski 1. ("Metal Edges").

The tail shape modifier 9 is constructed in a similar manner as a U-shaped piece comprising side portions 13, 14 joined by an end portion 15. The tail shape modifier 9 is flat and the side portions 13, 14 increase gradually in width along a major part of the ski tail section 2 until they join with the end portion 15. Tail shape modifier 9 is provided with metal edges for promoting "edging" action during skiing.

The tip shape modifier 8 is adapted for attachment to the ski tip section 3 by means of screw actuated expandable wedge assemblies 16 and dovetail grooves 17 in a manner to be described. Similarly, the tail shape modifier 9 is supplied with a detachable connector 18 and dovetails 19 to be described in detail.

Referring to Fig. 3 of the drawing, together with the cross section view of Fig. 5, together with the cross sectional views of Fig. 5 and Fig. 7, the tail shape modifier 9 is shown to be slightly thicker than tail section 2 of the ski and is longitudinally supported along tail section 2 by means of a dovetail 19 seen most clearly in Fig. 5, which is longitudinally insertable into a corresponding dovetail slot 2a on the lateral side of the tail section 2 of the ski. The detachable connector 18 consists of two separable parts, a bracket mounted on the platform 7 of the ski, and a flexible elastomeric retainer strap 20 attached to the rear portion 15 of the tail shape modifier 9. The bracket consists of a pair of upstanding sidewalls 21, 22 drilled to receive a removable retainer pin 23, and attached by bolts 24 to platform 7. The flexible retainer strap 20 extends between sidewalls 21, 22 and then has a wider section 20a which prevents longitudinal withdrawal of the strap 20 from between the sidewalls 21, 22. A preferable material for strap 20 is rubber of 100 durometer.

Referring to the enlarged cross sectional view of Fig. 7, the two upstanding sidewalls, one of which is seen at 21, each include a radius as shown at 21a to facilitate positioning of retainer strap 20. The retainer strap is attached to the tail shape modifier 9 by means of bolts 25.

Referring now to the tip shape modifier shown in Fig. 4, together with the cross sectional view shown in Fig. 6, modifier 8 is slightly thicker than the tip section 3 of the ski and includes a dovetail slot 15. Because the ski tip curves in a vertical plane, a special expandable wedge assembly 16 is employed. Wedge assemblies 16 are staggered and disposed along the length of the tip section 3 as shown in Fig. 4.

Referring to Fig. 6 of the drawing, the details of one of the wedge assemblies 16 is shown. A semi-circular metal carrier 26 contains a recess 26a housing metal wedging members 27, 28, each fitted with a half-dovetail extension 27a, 28a respectively. Wedging members 27, 28 each have a central hole, one with a left hand thread and one with a right hand thread receiving a mating bolt 29. Rotation of bolt 29 causes the two wedging members 27, 28 to move in opposite directions from one another so as to either grip or to release the dovetail slot

15 of the tip shape modifier 8. The wedge assemblies 16 are preferably made of aluminum and bonded with adhesive into the lateral side of tip section 3. Alternatively, wedge assemblies 16 can be made from any metal, plastic or other material suitable for providing the desired holding power (of tip shape modifier 8 to ski 1) and dynamic response under skiing conditions can be used.

Operation of the invention should be easily understood. When it is desired to convert the ski 1 from a cross-country ski to a downhill ski, the tip and tail shape modifiers 8, 9 are attached. The tip shape modifier 8 is attached by placing it over the tip section 3 and, with a suitable tool, tightening each of the wedge assemblies 16. The tail shape modifier 9 is attached by longitudinally sliding the two side parts 12, 13 in a forward direction from the rear of the ski by means of the dovetail slots 17 until the tail of the ski 6 abuts the end of modifier 9. Retainer pin 23 is removed and the flexible retainer strap 20 is stretched and pushed down between walls 21, 22, aided by the radius 21a on each of the walls, until the enlarged portion 20a of the strap is secured. Then the retainer pin 23 is replaced.

#### MODIFICATIONS

Another mechanism for attaching tail shape modifier 9 to ski 1 is shown in Figs. 8 and 9, which show cross sections of this invention taken along the length and width, respectively, of the ski. As shown in Fig. 8, a latch assembly 200 for attaching tail modifier 9 to ski 1 comprises an upstanding male latch member 210 and a female flexible latch member 250. Male latch member 210 has a top side 212 that is chamfered 213 along the tail side of the ski and has a leading side 214. Male latch member 210 defines screw holes 222' and 223' along front and tail portions that allow the male latch member to be easily attached to ski 1 preferably with flathead screws 222 and 223.

Female latch member 250 has a head section 252, a neck section 253 and a tail section 254. Head section 252 of the female latch member defines a chamfered bottom surface 258 and a locking inside surface 259. Flathead screws 255, 256 extending through openings 255', 256', respectively, defined in the tail section of the female latch member 250 attach the female latch member 250 to the ski. Female latch member 250 is preferably made from Delrin® material so as to allow the latch member to be strong and yet to flex easily vertically, a feature

that facilitates the sliding of the female latch member over the male latch member as described below.

As shown in Fig. 9, the facing sides of ski 1 and tail modifier 9 are provided with female and male surfaces respectively, for mating the sides of the ski and tail modifier in a dove tail fashion.

To assemble the tail shape modifier 9 to the ski 1, the tail modifier is slipped along the ski using the dovetail connection surfaces along the facing sides of the tail modifier and the ski. As female latch member 250 contacts male latch member 210, chamfered surface 258 of female latch member 250 is caused to flex vertically outwardly by chamfered surface 213 of the male latch member 210 so as to permit tail member 9 to contact the trailing edge 10 of the ski. At this point, inside surface 259 of the head section 252 of the female latch member 250 is allowed to clip in place along leading edge 214 of the male latch member 210 providing for tight holding between male and female latch members and so of the tail modifier 9 to the ski 1.

As an example of another mechanism for effecting attaching engagement of tip shape modifier 8 to ski 1, the screw 29 of wedge assembly 16 seen in Fig 6 can be replaced with a cam piece shown in Fig. 10. Cam piece 300 has a head member 310 provided with a handle 312, and a body 330. Along a mid-point of the outer surface of the cam body 330 is a pin 331 retained by a circumferential groove 332 in the body of ski 2. The cam piece 300 has a bottom surface 324 which is so beveled as to provide a cam surface.

In this arrangement, modified forms of top wedge member 270 and bottom wedge member 280 of Fig. 6 are designated by reference numbers 270 and 280 respectively. Cam piece 300 slips into an opening 353 defined in wedging member 270. Bottom wedging member 280 further defines a stepped region 281. Stepped region 281 has a top surface 282. Below bottom wedge 280 is a spring 283.

Turning of cam piece 300 inside wedging members 270 and 280 causes beveled surface to so rotate that angled region 324 of the cam piece moves against stepped region 281 of the bottom wedge, so that the wedging members 270 and 280 are forced outwardly with respect to each other. These outwardly forced wedging members when acted upon by the cam in this way cause the dovetail connections provided in the top member and ski to be firmly connected to each other. When the handle 312 is turned in the opposite direction spring 283 returns the bottom wedge to its unlocked position. It will be appreciated that use of a cam piece 300 in



place of screw 29 as just described allows for easy and ready attachment of tip member to the ski without the need to use a screw driver or alien wrench to effect the screw rotation.

### INDUSTRIAL APPLICABILITY

The tip shape modifier 8 and tail shape modifier 9 are relatively short and can be carried in a backpack. They do not impede the enjoyment of cross-country skiing, but are available for easy attachment when the skier wishes to traverse a steep downhill slope or ski through fresh powder, over ice, or under other snow terrain conditions. The enhanced hour-glass shape facilitates the downhill skiing.

While the preferred embodiment shows the wedge assemblies attached to the tip section and arranged to expand in dovetail slots in the tip shape modifier, the arrangement can be reversed with the wedge assemblies disposed in the tip shape modifier and arranged to expand in dovetail slots in the lateral edges of the tip section.

While the preferred embodiment shows the bracket disposed on the tail section of the ski and the flexible retainer strap attached to the tail shape modifier, the arrangement can be reversed with the bracket mounted on the tail shape modifier and the flexible strap attached to the tail section of the ski. Also the dovetail slots and dovetail extensions can be reversed.

The methods of attachment of the tip and tail shape modifiers for the ski are only illustrative of other suitable attachment types. While there has been shown what is considered to be the preferred embodiment of the invention, other modifications will become apparent to those skilled in the art and it is desired to cover such modifications in the appended claims.

## CLAIMS

1. Apparatus for converting a cross-country ski to a downhill ski, the cross-country ski being of the type having a central section with means for attachment to a skier's boot, a tip section extending forwardly from the central portion and curving upwardly, and a tail section extending rearwardly from the central section, the central section, tip section and tail section together being of substantially the same width, said apparatus being characterized by:

first and second attachment means disposed on the tip section and tail section respectively,

a tip shape modifier adapted to be attached to the first attachment means on the tip section and gradually increasing in width along a major part of the tip section toward the front of the ski,

a tail shape modifier adapted to be attached to the second attachment means on the tail section, and gradually increasing in width along a major part of the tail section toward the rear of the ski,

said tip shape modifier and said tail shape modifier being contoured so as to define, together with the ski central section, a generally hour-glass shape adapted for downhill skiing.

2. Apparatus according to Claim 1, wherein the first attachment means comprises a plurality of expandable wedge assemblies disposed along the lateral sides of the tip section, and wherein the tip section includes dovetail slots along its lateral sides adapted to receive portions of said wedge assemblies.

3. The apparatus according to Claim 2, wherein said wedge assemblies comprise a pair of screw actuated, oppositely threaded wedging members.

4. The apparatus according to Claim 2, wherein said wedge assemblies are made of aluminum and bonded with adhesive into the lateral sides of said tip section.

5. The apparatus according to Claim 1, wherein a plurality of wedge assemblies are disposed along each side portion of the tip shape modifier, and wherein the first attachment

means comprises a dovetail along each side of the tip section adapted to receive portions of the wedge assemblies.

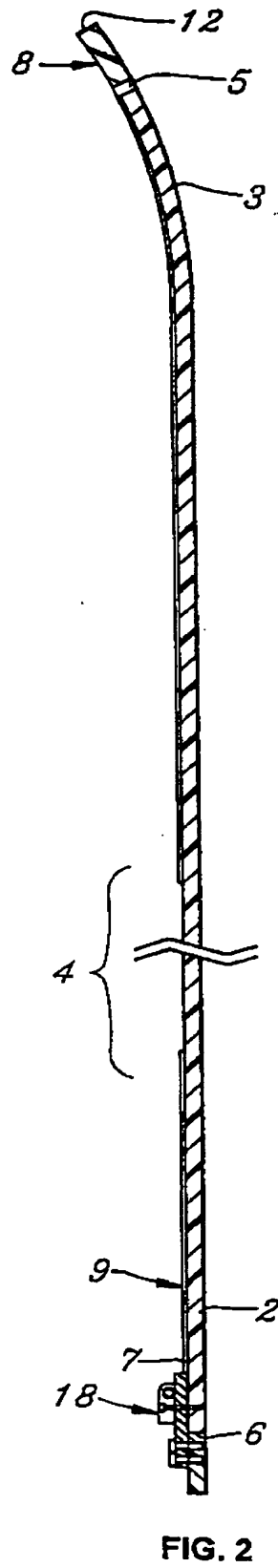
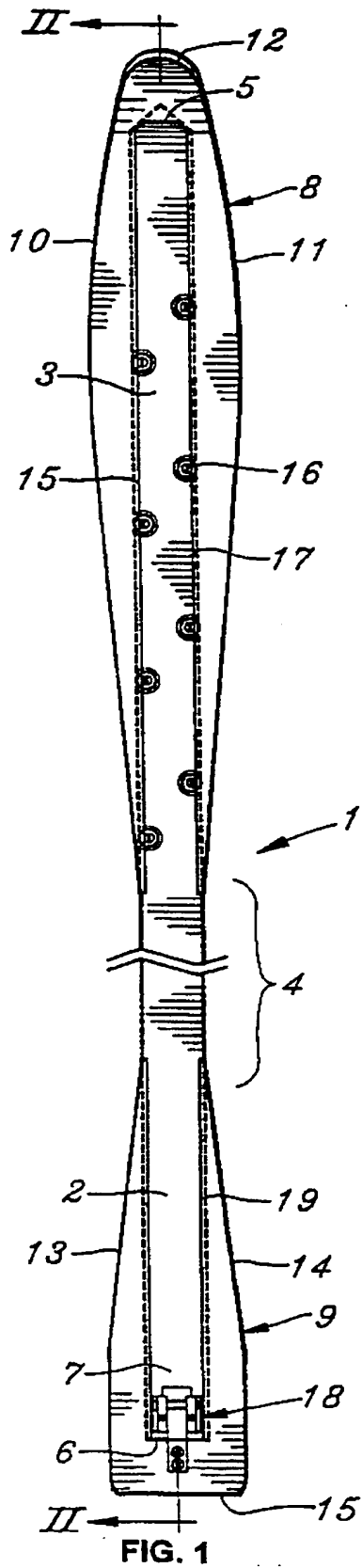
6. The apparatus according to Claim 1, wherein the second attachment means comprises a bracket mounted on the tail section and further including a flexible strap adapted to be detachably connected to said bracket, so as to hold the tail shape modifier to the tail section.

7. The apparatus according to Claim 1, wherein said second attachment means further comprises a dovetail along the lateral sides of the tail section, and wherein the tail shape modifier includes a mating dovetail.

8. The apparatus according to Claim 1, wherein said second attachment means comprises a flexible strap attached to the tail section, and further including a bracket mounted on the tail shape modifier adapted to receive said flexible strap and hold the tail shape modifier to the tail section.

9. The apparatus according to Claim 1, wherein the tail shape modifier is generally U-shaped and has a greater thickness than the tail section.

10. The apparatus according the Claim 1, wherein the tip shape modifier is generally U-shaped and has a greater thickness than the tip section.



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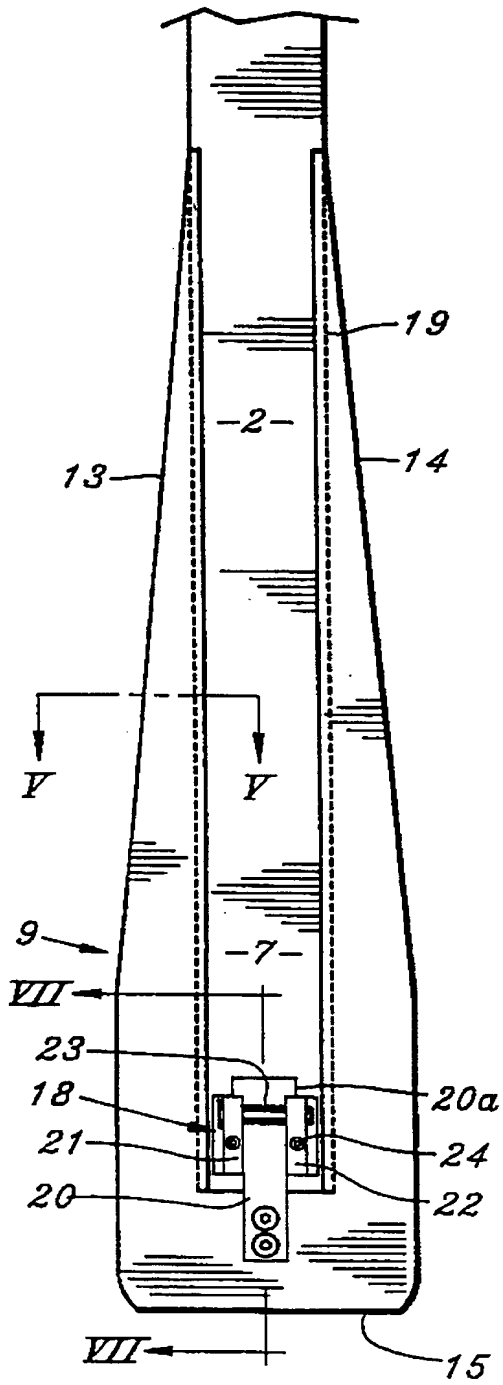


FIG. 3

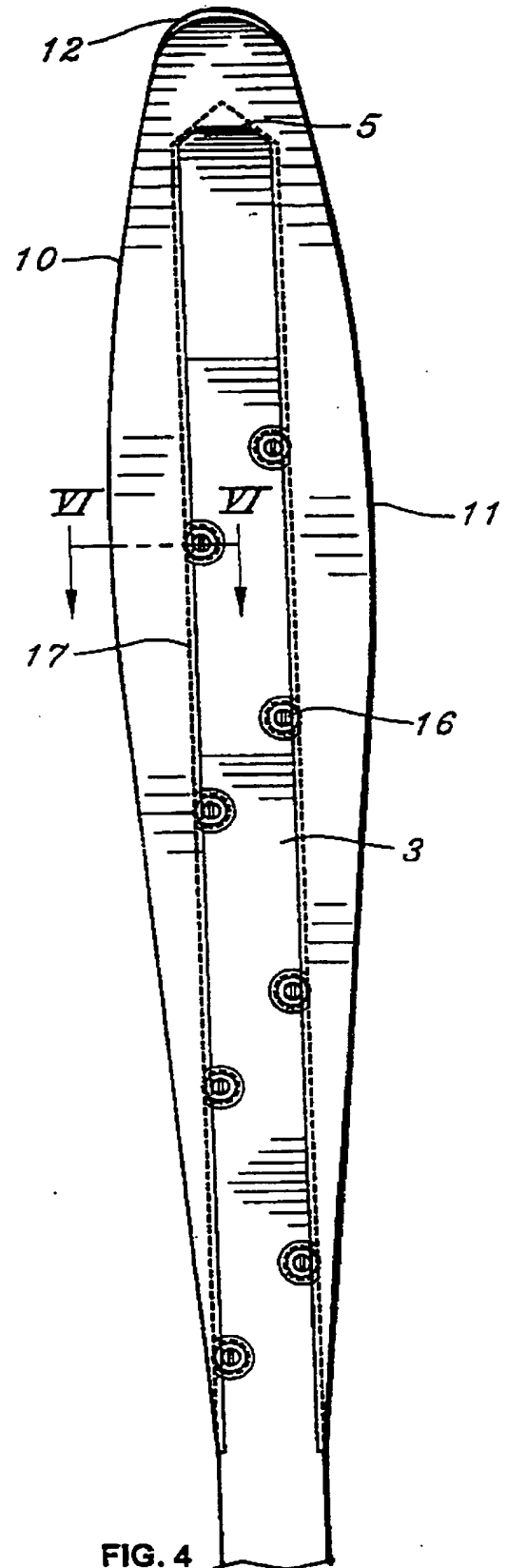


FIG. 4

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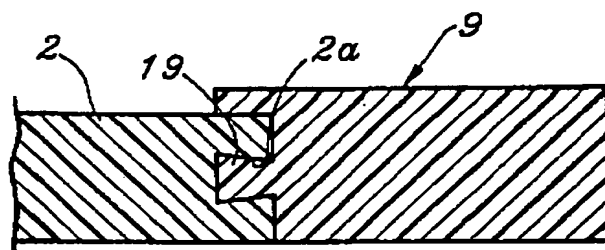


FIG. 5

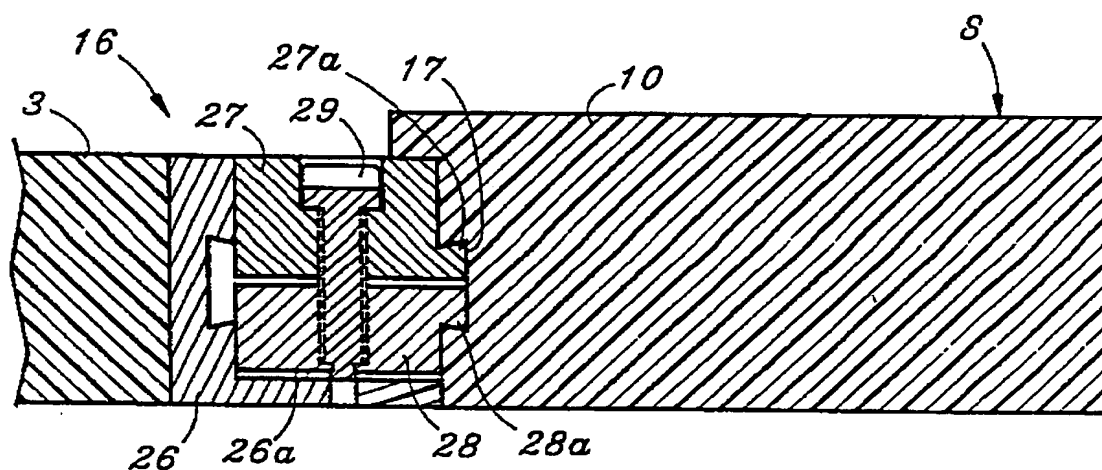


FIG. 6

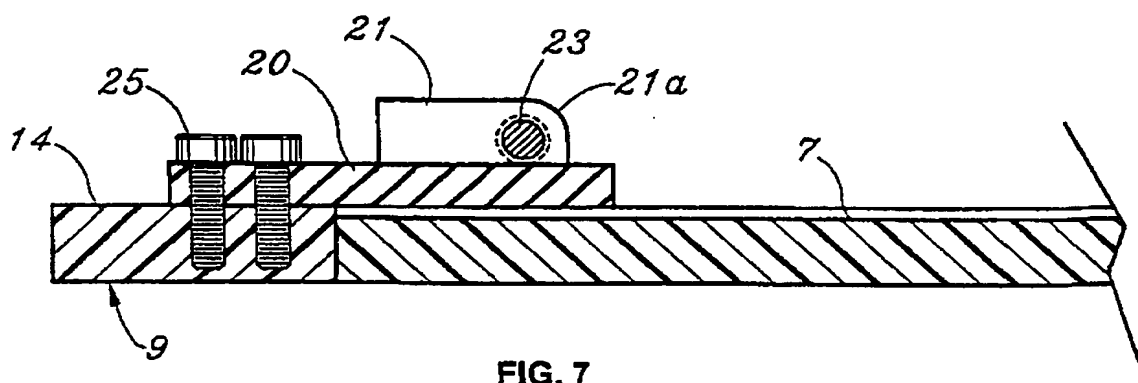


FIG. 7

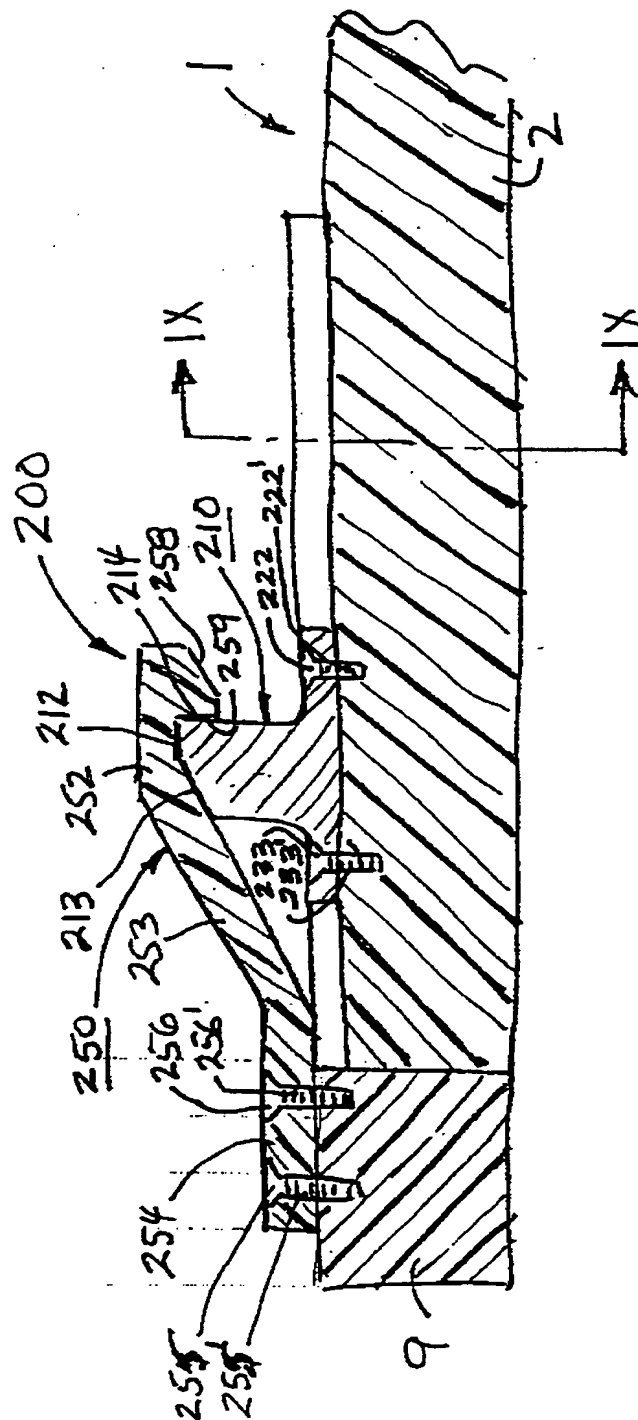


FIG. 8

FIG. 10

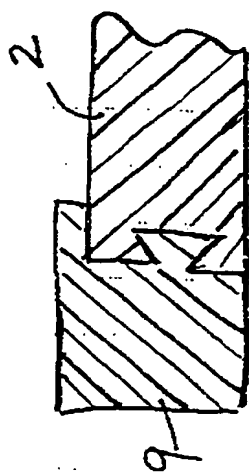
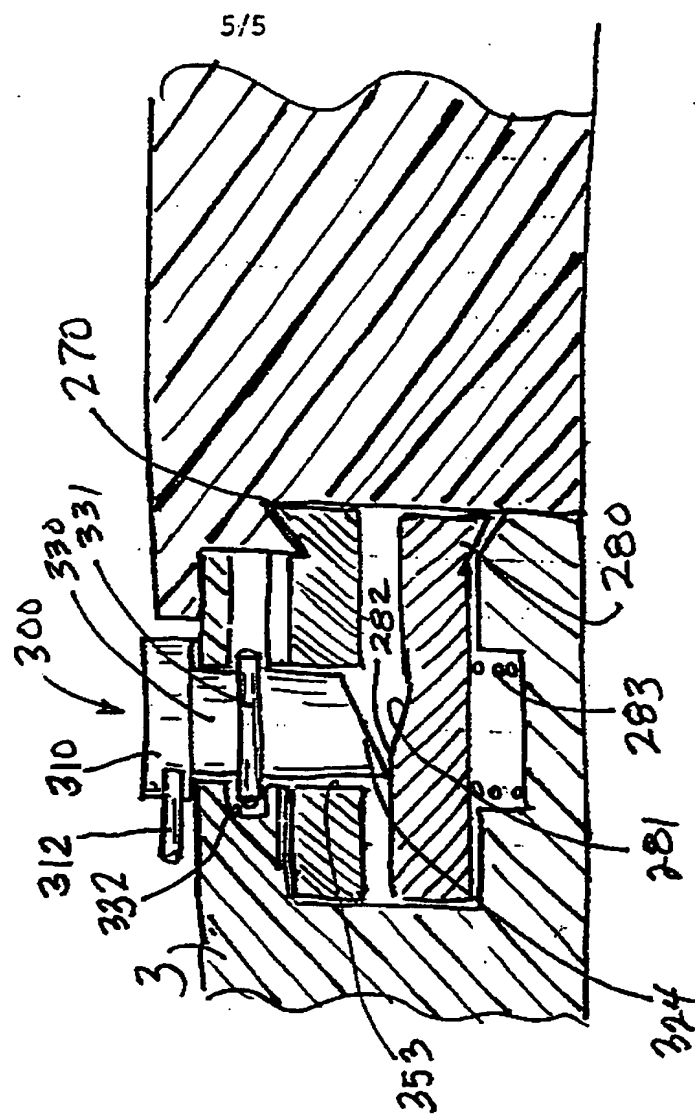


FIG. 9



# INTERNATIONAL SEARCH REPORT

International Application No

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**A. CLASSIFICATION OF SUBJECT MATTER**  
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According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

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IPC 6 A63C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 779 890 A (MUGNIER GEORGES) 25 October 1988 see the whole document	1
A	DE 38 06 061 A (TUA SKI SRL ;PIANA ANGELO (IT)) 8 September 1988 see the whole document	1
A	EP 0 207 601 A (SEVINGTON DAVID) 7 January 1987 see the whole document	1
A	US 2 410 702 A (ARSENAULT) 5 November 1946 cited in the application see the whole document	1

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Date of the actual completion of the international search

6 November 1998

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Information on patent family members

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